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ABSTRACT

It has been hypothesized that current methods of determining pay rates value the characteristics of jobs held primarily by men differently than the characteristics of jobs held primarily by women, resulting in lower earnings for women. A policy capturing approach using numerically rated job characteristics (PAQ data) was applied separately to the earnings of both men and women to determine which work behaviors were predictive of the earnings of each group. Resulting "male" and "female" job evaluation models were found to place occupations in essentially the same pay hierarchy, casting doubt on the hypothesis. It appeared that current systems in general use for valuing occupations contained little, if any, gender bias and were relatively neutral in their effects on the earnings differential. However, women were found to have lower representation in the higher paying positions within occupations and to be employed in somewhat greater proportions in occupations which paid less. Younger women were also found to earn about the same as older women while older men earned substantially more than younger men. Consequently, the earnings differential increased with worker age. (Author)

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JOB EVALUATION: PAY EQUITY PROBLEM OR SOLUTION?

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JOB EVALUATION: PAY EQUITY PROBLEM OR SOLUTION?

Abstract

It has been hypothesized that current methods of determining pay rates value the characteristics of jobs held primarily by men differently than the characteristics of jobs held primarily by women, resulting in lower earnings for women. A policy capturing approach using numerically rated job characteristics (PAQ data) was applied separately to the earnings of both men and women to determine which work behaviors were predictive of the earnings of each group. Resulting "male" and "female" job evaluation "models" were found to place occupations in essentially the same pay hierarchy, casting doubt on the hypothesis. It appeared that current systems in general use for valuing occupations contain little (if any) gender bias and are relatively neutral in their effects on the earnings differential. However, women were found to have lower representation in the higher paying positions within occupations and to be employed in somewhat greater proportions in occupations which paid less. Younger women were also found to earn about the same as older women while older men earned substantially more than younger men. Consequently, the earnings differential increased with worker age.

JOB EVALUATION: PAY EQUITY PROBLEM OR SOLUTION?

On average, women who work full-time and year-round outside the home receive hourly earnings of between 60 and 64% of men's earnings (Bureau of Census, 1984, pg. 1; Mellor, 1984).

Many aspects of this gender-related earnings differential have been researched and reported in what is now a voluminous literature. Reviews have been made by Blumrosen, 1979; Grune, 1980; Livernash, 1980, Treiman & Hartman, 1981; Milkovich & Newman, 1984, the U.S. Civil Rights Commission, 1984; Roback, 1986, and others. Emerging from this body of information is a growing recognition that the likely causes of the earnings differential are both varied and complex and that sufficient inadequacies exist in research design and data collection to leave much of the existing work open to serious criticism. It is not the purpose of this paper to review this literature, nor to enumerate all of the variables thought to be related to the earnings differential, nor to attempt an integration of the findings of previous research. On the contrary, the research reported here addresses a question that has remained largely unresolved. This question is: do current mechanisms for wage-rate setting favor jobs predominantly held by men to the disadvantage of those predominantly held by women? Practical extensions of this question are: 1) if job evaluation systems are found to be inherently biased, to what extent does their use contribute to the existing earnings differential, and 2), if inherently unbiased, will their objective and conscientious application

reduce or eliminate the differential?

Before going to the research, however, a brief review of the mechanics of job evaluation is in order. It is generally assumed that wage rates are largely set by supply and demand factors. Related to and often predictive of wage rates for particular jobs are the characteristics of the work performed. It is this relationship of job characteristics to pay that forms the basis for job evaluation. Jobs having similar characteristics are placed in similar relative positions along the pay hierarchy within organizations. The hierarchy, while indicating estimated relative value, does not have actual value until "priced" in a specific labor market. The organization's location and industry membership, the specific technology employed, and the time period involved all influence the wage level required to attract and retain qualified workers. Once the labor market(s) in which the organization operates is identified, the job hierarchy is "priced". This is typically done by collecting survey data on "key" jobs, plotting a regression line between pay hierarchy positions and actual pay rates for such jobs, and then generalizing the rates from the key jobs to other jobs having similar positions in the pay hierarchy. Even though average pay rates are estimated for each job, a range of rates about the average is typically established to permit the recognition of different levels of individual performance. On average, for most occupations, especially those involving complex tasks, performance tends to increase with experience and persons typically move upwardly through the range over time. Movement within this range

is a performance appraisal issue however, because it addresses differences in the performance of individuals employed on the same job rather than a job evaluation issue which deals with the value of jobs apart from the individuals who perform them.

Given this background information, the research question was approached directly with the understanding that actual earnings by an individual are not determined by any single factor. Further, that in order to determine if bias exists in underlying job evaluation mechanisms, some control will need to be exercised over factors extraneous to the relationship between job characteristics and earnings, but which also influence earnings.

The research was performed in two parts. The first deals with the search for possible gender-related bias in the mechanisms for determining the value of occupations (as opposed to the value of what is produced by specific individuals employed in occupations). The second part is a probing effort to try to better understand the nature of other variables which also influence earnings.

Part One - Do Current Systems of Valuing Job Characteristics Favor Occupations Employing Men?

This question was addressed using a "policy capturing" approach to determine if the underlying decision rules for valuing the job characteristics of occupations performed by men differed from those used in valuing the job characteristics of occupations performed by women.

As a methodology, policy capturing is used to isolate and determine the power of variables which may be related to decisions made. Variables thought to influence the decision are identified, measured, and correlated with the "decision" across a number of cases. In the present context, the relationships of job content variables (e.g., levels of decision making, responsiblity, working conditions, etc.) were studied to determine which variables were predictive of earnings (i.e., the market "decision" of an occupation's value). While such an analysis process can be performed on the basis of observation, judgement, and experience by an individual or a committee, it may also be performed statistically using multiple correlation and regression analysis (McCormick, Jeanneret, & Mecham, 1972; Robinson, Wahlstrom, & Mecham, 1974; Jeanneret, 1980; Mecham, 1983).

In this study, such a procedure was first used on men's earnings and then on women's earnings for a wide variety of occupations. The separate analyses were performed both to provide a basis for comparison and also to exercise some control over gender-related non-job-characteristics which might influence earnings. [For example, if (1) the earnings for men and women in each occupation were averaged and then correlated with the job characteristics of those occupations, and (2) some occupations were performed primarily by women which differed in terms of job characteristics, and (3) the women had less job experience than the men, it could appear that the job characteristics found on the women's jobs were paid less when in fact the differences were

really related to differences in job experience.] The results obtained from the separate samples were then compared to determine if there were indeed different systems (i.e., different decision rules) for valuing occupations held by men and women.

Method. Hourly 1979 earnings for full-time, year-round men and women workers were available in the 1980 U.S. census for 503 occupations (Bureau of Census, 1984, pgs. 1-253). Of these 503 occupations, data from analysts who made numerical ratings on a structured job analysis instrument, the Position Analysis Questionnaire (PAQ) (McCormick, Jeanneret, & Mecham, 1969, McCormick, Jeanneret, & Mecham, 1972) were also obtained from the master PAQ database for 403 occupations of which 397 cases were used. (Occupations were removed which had reported earnings less than the minimum wage rate of $2.90 per hour and physicians were removed because their earnings were much higher in comparison to all other occupational earnings). In order to match the PAQ data, [which had been classified using the Dictionary of Occupational Titles (DOT) (U.S. Department of Labor, 1977)], with the earnings data (which was classified by census code) it was necessary to cross-reference and average PAQ job profiles using DOT numbers and a "cross-walk" index which indicated how census and DOT numbers were related. This resulted in approximate PAQ profiles for the census occupations. The profiles consisted of 45 dimensions (principal components) of work (Mecham, McCormick, & Jeanneret, 1977, pgs. 73-120) This sample of averaged profiles represented occupations in which 93% of the positions in the U.S.

were found in 1979. Stepwise multiple regression was then used to identify and weight compensable PAQ factors. This was done separately for the PAQ factors that had been derived from the items within each of the six divisions of the PAQ, known as the "divisional" dimensions, and for the "overall" dimensions derived across all questionnaire items. Separate analyses were performed because the divisional and overall dimensions are two different ways of organizing the same PAQ item ratings and are therefore correlated and somewhat redundant (Mecham, McCormick, & Jeanneret, 1977, pg. 72). Reducing the number of predictors to the case count could also be expected to yield more stable results.

The analyses were also performed using two different methods of weighting the cases. Using one approach, the occupational data were weighted by a factor representing the proportion of the workers in the occupation to the total number of those workers in the sample. [This factor was: (397 cases) X (# in occupation / total number of men or women in sample of occupations).] The other approach was to treat each occupation as having the same weight, i.e., not applying any differential weighting. In this instance, equations were calculated using stepwise multiple regression on the same "unweighted" PAQ data for both the earnings of men and women.

Results. In performing the analysis, it was found that the earnings of men and women across all 503 occupations were substantially correlated (r = .84 when earnings were weighted by

the sum of the men and women workers in occupations, and .80 when unweighted) although the level of earnings for women was generally lower than that for men (Figure 1). In other words, women typically earned more in the same occupations in which men earned more. This result alone indicated that substantial similarity must exist in the way jobs are placed in an earnings hierarchy for both men and women. Additionally, it was found in the sample of 397 occupations for which PAQ and earnings data were available that the simple correlation coefficients on unweighted data between individual PAQ factors and the earnings of both men and women were much the same. (Of 45 PAQ dimensions of work examined, the most extreme difference in correlation coefficients was .14, with a median difference of .05. The simple correlation coefficients ranged between -.53 to .68.) However, the (regression) weights statistically assigned to the compensable factors were generally smaller for 'female' models than for 'male' models, reflecting the lower average earnings of women. For example, see Table 1, which indicates the PAQ dimensions statistically selected and weighted using "overall" dimensions and unweighted data on average monthly earnings (hourly earnings multiplied by 173.33 hours per month) for men and women.

Figure 1

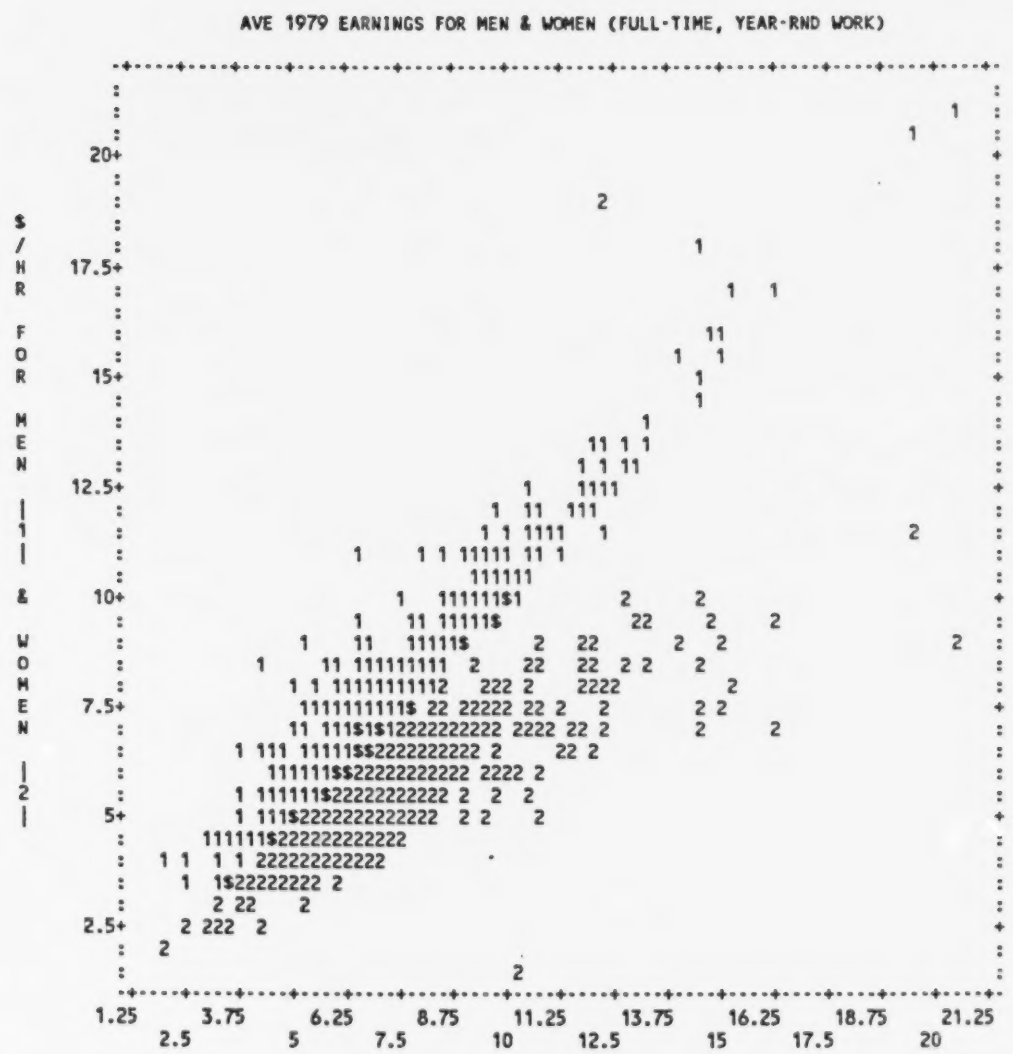

AVE 1979 EARNINGS FOR MEN & WOMEN (FULL-TIME, YEAR-RND WORK)
$/HR FOR MEN | 1 & WOMEN | 2
20+
17.5+
15+
12.5+
10+
7.5+
5+
2.5+
1.25
3.75
6.25
8.75
11.25
13.75
16.25
18.75
21.25
2.5
5
7.5
10
12.5
15
17.5
20
AVE $/HR FOR WORKERS 18 YRS+ BY OCCUP.
1:MYRHRWG WITH AVEHRWG 503 cases
2:FYRHRWG WITH AVEHRWG 503 cases
$:Multiple occurrence

Table 1

Regression Equations Developed Using Unweighted Overall PAQ Dimensions to Predict Monthly Average Earnings of Men and Women (N = 397 Occupations)

PAQ Dimensions	Weights for Earnings of: Men	Women
33. Having decision, communicating, and general responsibilities	241.50	144.30
34. Operating machines/equipment	-94.94	-47.97
36. Performing technical/related activities	48.91	39.68
37. Performing service/related activities	-226.01	-134.72
41. Engaging in physical activities	-166.48	-63.81
43. Public/customer/related contacts	------	-54.99
44. Working in unpleasant/hazardous/ demanding environment	68.90	45.29
45. Non-typical work schedule/optional apparel	-99.24	-100.33
(Constant)	1416.30	961.10

The correlation coefficients of the predicted earnings from various models (using "overall" and "divisional" job dimensions and calculated with and without differential weighting) with: (1) the earnings of men and women and (2) the predictions of the other models are shown in Table 2.

Table 2

Inter-correlation of Predicted Earnings from Various Job Evaluation Models Developed on Men's and Women's Earnings and Correlations with Earnings

(N = 397 Occupations)

Unweighted Sample

	Variables (Defined at Left)					
	1	2	3	4	5	6
1. Men's Earnings	1.00					
2. Women's Earnings	.85	1.00				
3. Male Equation (Overall dims.)	.78	.72	1.00			
4. Female Equation (Overall dims.)	.75	.75	.96	1.00		
5. Male Equation (Divisional dims.)	.79	.74	.94	.91	1.00	
6. Female Equation (Divisional dims.)	.77	.78	.91	.93	.95	1.00

Sample Weighted by the Number of Men in Each Occupation

	1	2	7	8
1. Men's Earnings	1.00			
2. Women's Earnings	.81	1.00		
7. Male Equation (Overall dims.)	.87	.76	1.00	
8. Male Equation (Divisional dims.)	.89	.74	.95	1.00

Sample Weighted by the Number of Women in Each Occupation

	1	2	9	10
1. Men's Earnings	1.00			
2. Womens's Earnings	.81	1.00		
9. Female Equation (Overall dims.)	.79	.86	1.00	
10. Female Equation (Divisional dims.)	.81	.89	.97	1.00

To find out how comparable the models were which were developed using different weighting schemes and different PAQ dimension scores, each model was used to predict earnings for all 397 occupations and correlation coefficients between the models' predictions were calculated under each of the original weighting schemes. The results are reported by weighting scheme in Table 3.

Table 3

Correlations between Different Earnings Prediction Models as Calculated with Different Weighting Schemes

(N = 397 Occupations)

Unweighted Sample

Models by Sex, Weighting, and Dimensions Used[1]	Models (Defined at Left)							
Male Models	3	5	7	9	4	6	8	10
3. Unwghtd, Ovrl Dims.	1.00							
5. Unwghtd, Div. Dims.	.94	1.00						
7. Wghtd, Ovrl Dims.	.97	.89	1.00					
9. Wghtd, Div. Dims.	.92	.94	.90	1.00				

Female Models								
4. Unwghtd, Ovrl Dims.	.96	.91	.93	.89	1.00			
6. Unwghtd, Div. Dims.	.91	.95	.89	.89	.93	1.00		
8. Wghtd, Ovrl Dims.	.93	.89	.86	.86	.95	.91	1.00	
10. Wghtd, Div. Dims.	.89	.89	.84	.82	.91	.93	.93	1.00

Weighted by Number of Men in Occupations

Models by Sex, Weighting, and Dimensions Used[1]	Models (Defined at Left)							
Male Models	3	5	7	9	4	6	8	10
3. Unwghtd, Ovrl Dims.	1.00							
5. Unwghtd, Div. Dims.	.97	1.00						
7. Wghtd, Overall Dims.	.98	.94	1.00					
9. Wghtd, Div. Dims.	.96	.97	.95	1.00				
Female Models								
4. Unwghtd, Ovrl Dims.	.97	.93	.95	.91	1.00			
6. Unwghtd, Div. Dims.	.94	.97	.91	.93	.95	1.00		
8. Wghtd, Ovrl Dims.	.94	.90	.87	.89	.97	.93	1.00	
10. Wghtd, Div. Dims.	.92	.91	.88	.87	.94	.96	.96	1.00

Weighted by Number of Women in Occupations

Models by Sex, Weighting, and Dimensions Used[1]	Models (Defined at Left)							
Male Models	3	5	7	9	4	6	8	10
3. Unwghtd, Ovrl Dims.	1.00							
5. Unwghtd, Div. Dims.	.95	1.00						
7. Wghtd, Ovrl Dims.	.98	.90	1.00					
9. Wghtd, Div. Dims.	.93	.96	.90	1.00				

Female Models

4. Unwghtd, Ovrl Dims.	.96	.93	.94	.93	1.00		
6. Unwghtd, Div. Dims.	.92	.97	.87	.93	.95	1.00	
8. Wghtd, Ovrl Dims.	.93	.90	.88	.89	.97	.93	1.00
10. Wghtd, Div. Dims.	.91	.91	.88	.88	.95	.95	.97 1.00

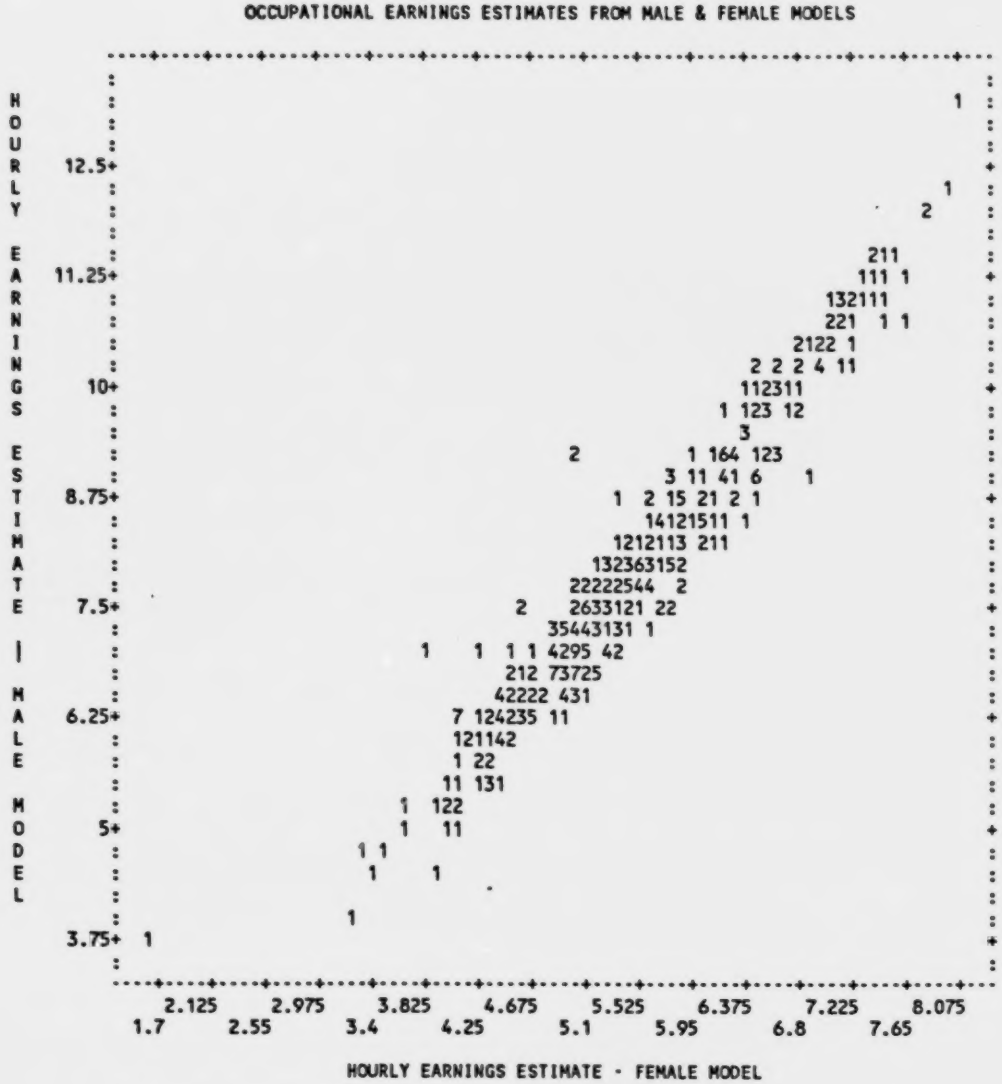
[1] Unwghtd = Unweighted; Wghtd = Weighted; Ovrl Dims. = Overall Dimensions; Div. Dims. = Divisional Dimensions.

As can be observed in Table 3, the predictions made by all of the models are highly inter-correlated, being between. 82 and .97, regardless of the weighting scheme used in the deriving the equations, or the weighting scheme used when the predictions are correlated. Careful study does indicate however, that equations developed using the "overall" dimensions correlate at a consistent and typically higher level with the results of the other equations than those developed with divisional dimensions.

The similarity in the pay hierarchies which result from such models can be graphically illustrated using the male and female equations developed using overall dimensions on the unweighted sample (see Figure 2).

It is concluded that the underlying mechanisms for establishing the position of occupations in a pay hierarchy yield highly correlated, (if not the same results) for occupations held by men and women when differences in weighting characteristics and variable characteristics are considered. Because of this, the use of job evaluation can be expected to have little effect

Figure 2



397 cases plotted.

on reducing the earnings differential. It also appears that in the practical situation a number of the job evaluation models developed could be used to establish pay hierarchies, being derived on either the earnings of men or women. Such hierarchies could then be priced in the applicable labor market(s).

Given these findings a probing effort was made to better understand what <u>does</u> account for the large differences in actual average earnings?

Part Two: How much of the Pay Differential Occurs because Women are Employed in Low Paying Occupations and Positions?

In the earlier review of the mechanics of job evaluation, it was stated that a variety of factors are involved in determining the pay of an individual. However, from a strictly compensation administration perspective, such earnings differences within the firm may be described in three basic ways: (1) there may be different methods for valuing jobs. (Given the findings reported above, this does not seem likely.); (2) women may be concentrated in jobs/occupations for which pay is low and/or (3); they may be concentrated in the lower areas of the pay ranges for occupations in which they work.

In most firms, these issues can be addressed in a relatively straightforward manner by calculating differences in pay for men and women within occupations or pay grades and then calculating how much of the difference in average pay rates is associated

with the distribution of men and women across pay grades (see Sieling, 1984, for a related analysis). However, when such comparisons are made across firms, one must also consider the possibility that women may be concentrated in firms which generally pay less for all types and levels of work because of location, industry, or the technology employed. Since variables indicating such factors were not available in the census data, these effects will be grouped together and called an ORGANIZATION effect. Further, there may be errors in assigning jobs to occupational categories which may also introduce a bias. For example, the jobs within a grade performed predominantly by women (or within an occupation, in the case of the census data used) may actually be different in their underlying value than those performed predominantly by men in the same grade occupation (a CATEGORIZATION effect).

While at least these and other possible limitations exist in trying to determine what accounts for earnings differences, it should be possible, nonetheless, to obtain some general estimates of the relative strength of some of the variables involved. With this in mind, an analysis was performed to determine how much of the difference in earnings occurred between men and women working in the same occupations. In doing this, the average earnings of women were calcuated as if the women had the same earnings as the men within those occupations. While women actually earned an average of $5.21 and men $8.61 per hour, if women's earnings had been at the same rate as men's earnings (in

the occupations in which women were employed), their average earnings would have been $7.87 per hour. The difference between $5.21 and $7.87 is an estimate of how much of the difference in earnings is associated with the position (or work level) within the occupation. (As the census data is taken across firms, "organization" and "categorization" effects are likely to be part of this estimate as well.) The difference between $7.87 and $8.61 is associated with the value of the type of occupation worked. That is, if the positions within the occupations held by women had paid the same as those held by men in the same occupations, there would still be a difference in the average earnings of men and women of 74 cents (i.e., $8.61 - $7.87).

To state the findings in percentage terms, women actually earned 60.5% of what men earned. If they earned as much as men did within the occupations in which they were employed, they would earn 91.4%, reducing the earnings differential by 30.9%. To eliminate the remaining 8.6% difference, they would need to work at occupations for which earnings were as high as the occupations performed by men.

From the foregoing analysis it is evident that the major portion of the difference in the average earnings of men and women is associated with the position held within an occupation (which may include "organization" and "categorization" effects), rather than differences in the value associated with the occupations held. Some final exploratory analyses were therefore aimed at trying to understand the dynamics associated with

earnings differences within occupations.

As indicated earlier, job performance variables are known to be associated with differences in pay within occupations. While job performance variables were not part of the census data, earnings were reported by age categories. As older workers are likely to have more experience and tenure in an occupation, an analysis was performed to determine how earnings differences were related to age for both men and women. When the earnings of men 55-64 years of age were compared to those of men 25-34 years of age, the increases in earnings were large and as expected (Figure 3). However, when earnings of women 55-64 years old were compared with those of women 25-34 years of age, they differed only modestly (Figure 4). In other words, the average earnings of men when observed on a cross-sectional basis were found to increase significantly with age while those of women showed little if any increase.

Average earnings for women in the two age groups were also calculated as if the women had earned at the same level as the men within the occupations in which the women were employed. It was found that if women 25-34 years old (who had average hourly earnings of $5.39) had earned at the same rate as men of comparable age, the average earnings would be $7.06 per hour compared to $7.59 for men (a ratio of .930). The ratio of women's actual earnings to those of men in this age group was .71. When these calculations were performed for women and men 55-64 years of age, women's average earnings (which were $5.40) would have

Figure 3

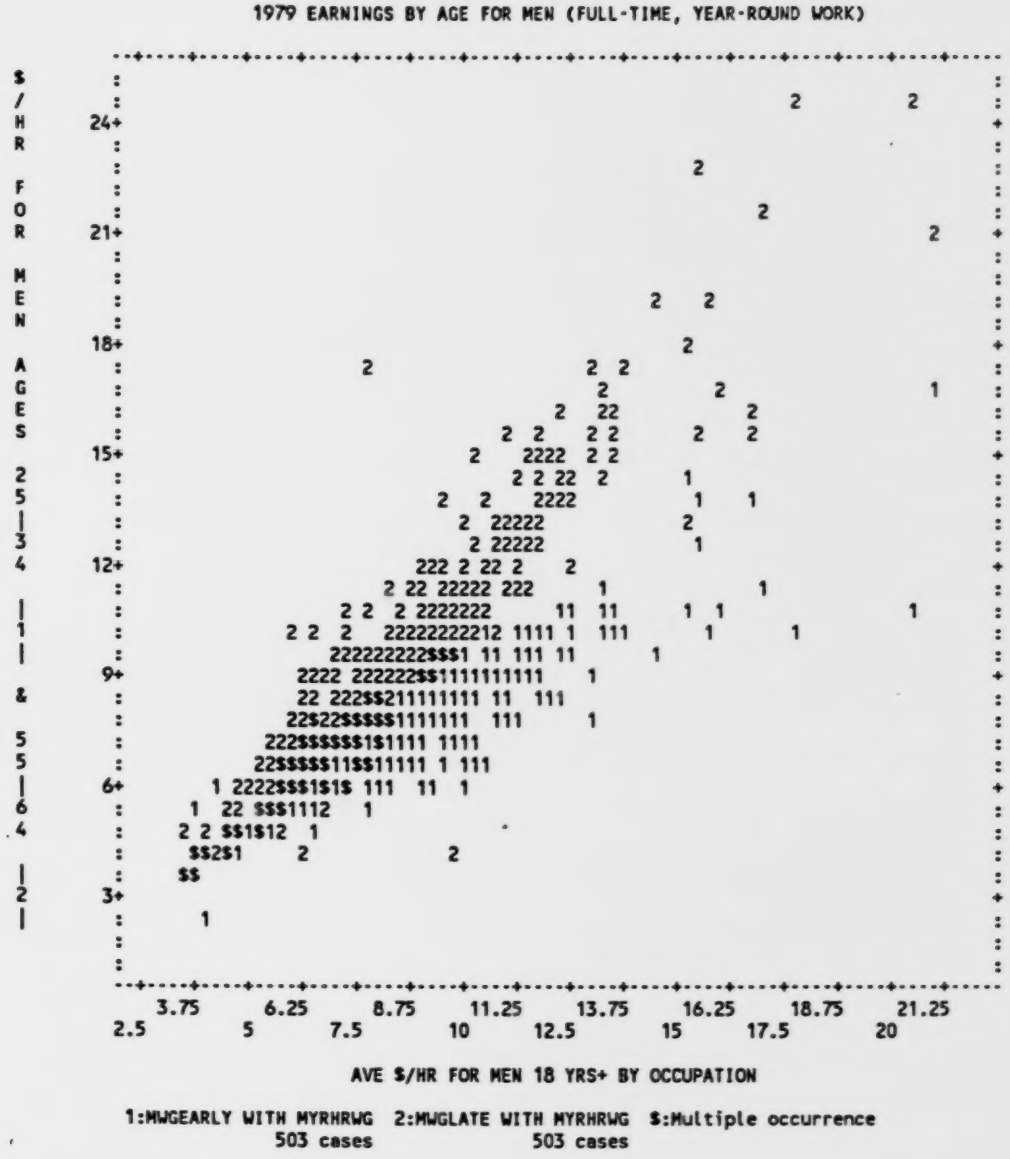
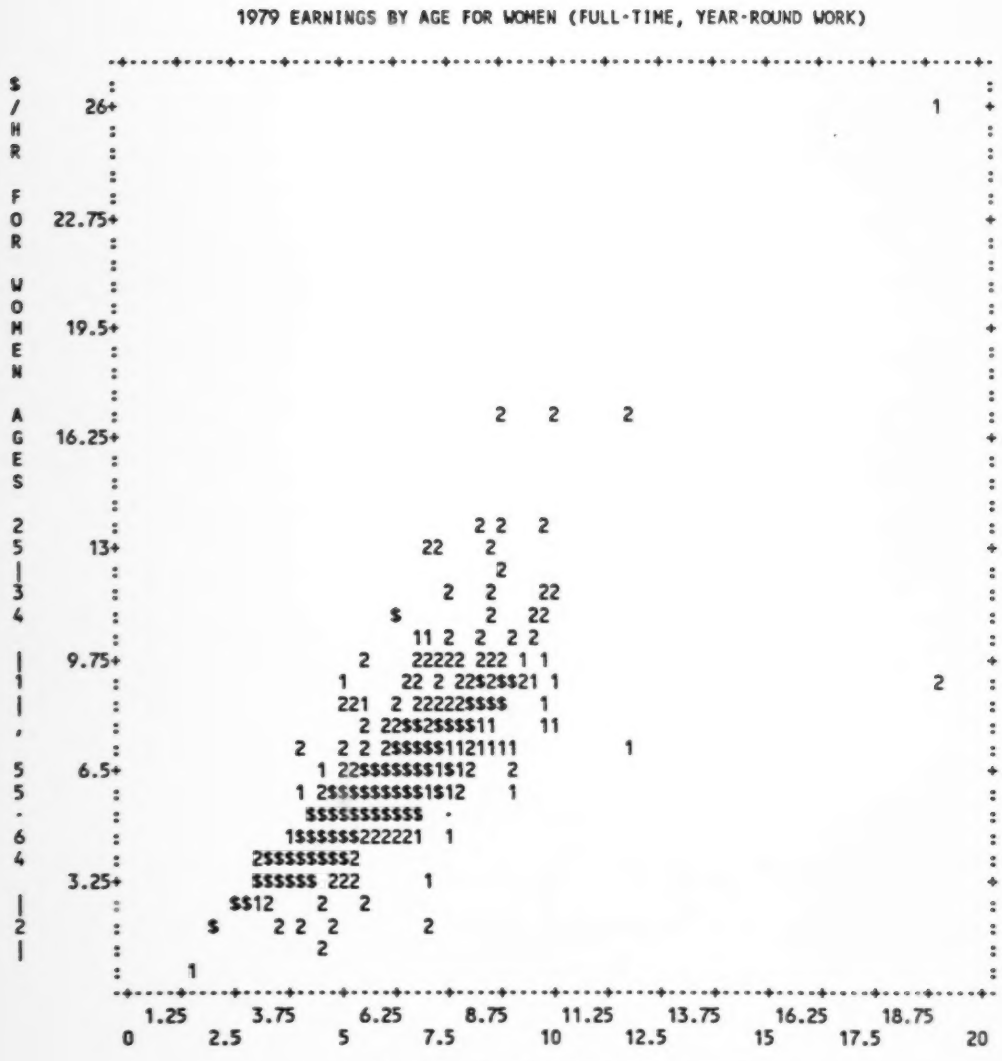

1979 EARNINGS BY AGE FOR MEN (FULL-TIME, YEAR-ROUND WORK)
$/HR FOR MEN AGES 25 | 34
24+
21+
18+
15+
12+
9+
6+
3+
3.75
6.25
8.75
11.25
13.75
16.25
18.75
21.25
2.5
5
7.5
10
12.5
15
17.5
20
AVE $/HR FOR MEN 18 YRS+ BY OCCUPATION
1:MWGEARLY WITH MYRHRWG 503 cases
2:MWGLATE WITH MYRHRWG 503 cases
$:Multiple occurrence

Figure 4


1979 EARNINGS BY AGE FOR WOMEN (FULL-TIME, YEAR-ROUND WORK)
$/HR FOR WOMEN AGES 25-34
26+
22.75+
19.5+
16.25+
13+
9.75+
6.5+
3.25+
1.25
3.75
6.25
8.75
11.25
13.75
16.25
18.75
0
2.5
5
7.5
10
12.5
15
17.5
20
AVE $/HR FOR WOMEN 18 YRS+ BY OCCUPATION
1:FWGEARLY WITH FYRHRWG 2:FWGLATE WITH FYRHRWG $:Multiple occurrence
502 cases
491 cases

been $8.74 compared to $9.58 for men (a ratio of .912) and the ratio of actual wages was .56.

In sum, while cross-sectional data of this type can lead to inaccurate conclusions about the future, as the men and women coming into the workforce may not follow the previous pattern, current differences in average wages are age related. The ratio of actual earnings for women and men decreased considerably with age (from .71 for workers 25-34 years of age to .56 for workers 55-64 years of age) as the earnings of men increase and those of women remain at about the same level. The change in the ratios for women's earnings, had they earned at the same rate as comparably aged men in their occupation, from .93 for the younger women to .912 for the older women suggests that either younger women are going into higher paying occupations or older men move to such occupations more so than women. Given the much different ratio of women's to men's actual earnings for the younger (.71) and older (.56) workers, younger women may well be different than their predecessors both in choice of occupation and in the positions held within those occupations.

These findings suggest that research be focused on understanding the impact of changes in positions and occupational choice during the careers of women on earnings.

Conclusions. The important findings of this research are: (1) the underlying value systems for establishing the earnings hierarchy of occupations are much alike when established from either earnings of men or women; 2) differences in the value of

the occupations performed by men and women account for some differences in earnings (about 8.6% of the average man's wage); 3) differences in earnings by positions within occupations account for the largest share of the differences (about 30.9%); and 4) differences in earnings between men and women become more pronounced with age, suggesting that career development is not the same for men and women.

Recommendations. In view of these findings, organizations are advised to use job evaluation systems that use the same decision rules for valuing jobs held by men and women. Policy-capturing approaches which use market-based earnings data from a broad spectrum of occupations appear to generate systems that favor neither men nor women. As most of the difference in earnings was found to be related to positions held within occupations, performance appraisal, merit, and other programs that may effect step-increases within pay grades need to be well-conceived, documented, and fairly administered. Career development programs may be considered to prepare more women for higher level positions within occupations and movement into higher paying occupations.

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